Space Weather Forecast

Issued on Tuesday, 19 September 2023 at 13:11 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further G1-G2 minor/moderate storms possible day 1 (Tuesday 19th September), with CME (coronal mass ejection) effects. Chance of isolated R1 Minor Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the past 24 hours. There are currently eight numbered sunspot regions on the visible disc. The previously active sunspot region in the northwest has continued to see a general weakening with two regions in the northwest and southwest continuing to develop in the western hemisphere. The largest region on the disk remains in the northeast, this region has seen its previous leading spot re-numbered as a separate region, which is now growing a ringlet around it, so one to watch (ringlets are known to destabilise the local magnetic structure).

No new Earth-directed Coronal Mass Ejections (CMEs) were observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds started the period at slightly elevated levels before rapidly changing from 18/1255 UTC with the arrival of a CME, with speeds becoming elevated and varying between 500-600km/s through the remainder of the period. The total magnetic field was steady at Moderate levels initially, with a rapid increase following the arrival of the CME to become strong before a slow decline back towards moderate by the end of yesterday. The north-south component showed a similar trend starting moderately positive with the arrival of the CME, before varying strongly in recent hours. Geomagnetic activity, as measured by BGS, was at Active to G1 Minor geomagnetic storm with the arrival of the CME, and peaked at G3 Strong geomagnetic storm in the 19/0300-0600 UTC interval.

UK Aurora Analysis: Some aurora sightings were received from Scotland overnight as well as a few places in England.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain generally Low, but with a continued chance of isolated Moderate flares.

Solar Wind / Geomagnetic Activity: There are currently two CMEs that feature in the forecast. The first CME is likely associated with a moderate flare on the 14 Sep. This feature may be the CME moving through the near Earth environment in the past 24 hours. There remains uncertainty with a second and perhaps more significant CME expected from a large filament (arc of plasma) lift off which occurred early on the UTC day of 16 Sep. Modelling suggests an Earth directed component with an arrival time sometime during the remainder of Day 1 (19 Sep). Analysis of both these features was complex however, reducing forecast confidence, and it may

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be that the CME that has so far affected Earth may be associated with an early arrival of the second CME. Either way CME effects are expected to continue through Day 1 (19 Sep), before easing into Day 2 (20 Sep). Unsettled to Active geomagnetic activity at first, with a Chance of a G2 moderate storm due to the potential arrival of further CME activity associated with the filament eruption on 16 Sep. CME effects probably lingering into Day 2 (20 Sep) but likely waning by Days 3-4 (21-22 Sep), with generally Quiet to Unsettled conditions returning.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with only a slight chance of an enhancement should any larger flares occur, or perhaps early in the period in association with CME arrival.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	60	40	10	1
Strong	G3	No	20	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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